Federal Aviation Administration – Regulations and Policies
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
Airworthiness Assurance Working Group

Task 7 – Multiple Complex Supplemental Type Certificate Modification

Task Assignment

[Federal Register: March 22, 2001 (Volume 66, Number 56)]
[Notices]
[Page 16089-16090]
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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues--New Task

AGENCY: Federal Aviation Administration (**FAA**), DOT.

ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC).

SUMMARY: The **FAA** assigned the Aviation Rulemaking Advisory Committee a new task to study the effects of multiple complex structural supplemental type certification (STC) modifications installed on transport category airplanes. The ARAC will develop a report with recommendations for a long-term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operations of transport category airplanes. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: John McGraw, 1601 Lind Ave., Renton, Washington 98055-4056, 425-227-1171, john.mcgraw@**faa**.gov.

SUPPLEMENTARY INFORMATION:

Background

The **FAa** established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the **FAA** Administrator on the **FAA**'s rulemaking activities with respect to aviation-related issues.

The Task

Study the effects of multiple complex structural STC modifications installed on transport category airplanes. Develop a report with recommendations for a long term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operation of transport category airplanes, and the ability of the operators to accomplish mandatory **FAA** aging fleet programs.

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The report should identify the types of structural modifications considered to be complex STC modifications, and should propose recommended actions to be taken by the **FAA** to address the effects

complex structural STC modifications have on the structural integrity and continued safe operation of modified airplanes.

The report and recommendations should contain the following:

1. A description of **FAA** and industry actions necessary to identify the interaction effects of multiple complex STC modifications,

2. A description of **FAA** and industry actions that will address the effects that complex modifications have on aging aircraft issues, and

3. A description of **FAA** and industry actions necessary to address the effects that complex modifications have on **FAA** mandated airworthiness actions (i.e., airworthiness directives, aging aircraft programs).

Schedule: The report should be completed no later than September 28, 2002.

ARAC Acceptance of Tasks

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the **FAA**.

Working Group Activity

the Airworthiness Assurance Working Group is expected to comply with the procedures adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations prior to proceeding with the work stated in item 3 below.

3. Draft the appropriate documents and required analyses and/or any other related materials or documents the working group determines to be appropriate.

4. Provide a status report at each meeting of the ARAC held to consider transport airplane and engine issues.

Participation in the Working Group

The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and stating the expertise he or she would bring to the working group. All requests to participate must be received no later than April 30, 2001. All requests will be reviewed by the assistant chair, the assistant executive director, and the working group chair. Individuals will be advised whether or not the request can be accommodated.

Individuals chosen for membership on the working group will be

expected to represent their aviation community segment and actively participate in the working group (e.g., attend all meetings, provide written comments when requested to do so, etc.). They also will be expected to devote the resources necessary to support the working group in meeting any assigned deadlines. Members are expected to keep their management chain and those they may represent advised of working group activities and decisions to ensure that the agreed technical solutions do not conflict with their sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

Once the working group has begun deliberations, members will not be added or substituted without the approval of the assistant chair, the assistant executive director, and the working group chair.

The Secretary of Transportation determined that the formation and use of the ARAC is necessary and in the public interest in connection with the performance of duties imposed on the **FAA** by law.

Meetings of the ARAC will be open to the public. Meetings of the Airworthiness Assurance Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. The **FAA** will make no public announcement of working group meetings.

Issued in Washington, DC, on March 14, 2001.

Anthony F. Fazio,

Executive Director, Aviation Rulemaking Advisory Committee.

[FR Doc. 01-7068 Filed 3-21-01; 8:45 am]

BILLING CODE 4910-13-M

Recommendation Letter

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

September 18, 2003

Federal Aviation Administration
800 Independence Avenue, SW
Washington, D.C. 20591

Attention: Mr. Nicholas Sabatini, Associate Administrator for Regulation and Certification

Subject: ARAC Recommendations, Airworthiness Assurance – Multiple Complex STC's

Reference: ARAC Tasking, Federal Register, dated March 21, 2001

Dear Nick,

The Transport Airplane and Engine Issues Group is pleased to submit the following as a recommendation to the FAA in accordance with the reference tasking. This information has been prepared by the Airworthiness Assurance Working Group.

- Recommendations for Regulatory Action to Enhance Continued Airworthiness of Supplemental Type Certificate

The FAA is asked to note that the Working Group was not tasked to evaluate non-structural (systems) modifications and these types of STC's are not addressed in the report.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
Effie Upshaw – FAA-Washington, D.C.
Amos Hoggard - Boeing

Acknowledgement Letter

MAR 8 2004

Mr. Craig Bolt
Assistant Chair, Transport Airplanes and
Engines Issues Area
400 Main Street, MS 162-14
East Hartford, CT 01608

Dear Mr. Bolt,

This letter responds to several letters from the Aviation Rulemaking Advisory Committee (ARAC) on Transport Airplanes and Engines (TAE) during calendar year 2003.

Date of Letter: May 14

Purpose: A request for economic support for a proposed part 25 rulemaking addressing ice protection systems.

FAA Action/Status: Kathy Ishimaru, the Federal Aviation Administration (FAA) representative on the Ice Protection Harmonization Working Group, and George Thurston of the FAA Policy Office indicated that Mr. Thurston has already provided the economic data to the working group. No further action is warranted.

Date of Letter: July 22

Purpose: Transmittal package with opposing views related to the ease of search task from the members of the Design for Security Harmonization Working Group.

FAA Action/Status: At the June TAE ARAC meeting, after learning the working group could not reach consensus, Mr. Kaszycki asked the working group to document its views and forward the package to the FAA through ARAC. The package has since been forwarded to the Transport Airplane Directorate for review and decision.

We may request the working group to help us dispose of substantive comments once the comment period for the notice of proposed rulemaking closes. Hence, we consider the working group to be in existence, but in-active until further notice.

This letter also acknowledges receipt of several recommendation packages:

Date of Letter	Task No.	Description of Recommendation	Working Group
Sep 18 ANM-01-024-A	7	Working group report with a long term plan addressing the effects of multiple complex structural supplemental type certification modifications on the structural integrity and continued safe operations of transport category	Airworthiness Assurance

		airplanes	
Sep 19	11 9	Working group report that provides language for a requirement to substantiate the operation of the airplane control systems is not adversely affected (jamming, friction, disconnection, damage) by the presence of deflections of the airplane structure due to the separation of pitch, roll, and yaw limit maneuver loads (25.683) Working group report that provides harmonized rule language and advisory material for fuel tank access cover impact resistance (§ 25.963(e))	General Structures Harmonization
Oct 21	3, Part 1	Working group report addressing ventilation (heating and humidity), § 25.831(g)	Mechanical Systems Harmonization
Oct 21	3, Part 2	Working group report addressing cabin pressurization, § 25.841(a)	Mechanical Systems Harmonization
Oct 22	5	Working group report that provides harmonized § 25.571 language and accompanying advisory material for damage tolerance and fatigue evaluation of structure	General Structures Harmonization
Oct 22	6	Working group reports on widespread fatigue damage that address training syllabus, multiple element damage, and mandatory modifications	Airworthiness Assurance

I wish to thank ARAC and the working groups for the resources that industry gave to develop these recommendations. Since we consider submittal of the recommendation as completion of the tasks, we have closed the tasks, and placed the recommendations on the ARAC website at http://www1.faa.gov/avr/arm/arac/aracTransportAirplane.cfm?nav=6. The recommendation packages have been forwarded to the Transport Airplane Directorate for review and decision. We will continue to keep you apprised of our efforts on the ARAC recommendation at the regular ARAC meeting.

Sincerely,

Original Signed By
Nicholas A. Sabatini

Nicholas A. Sabatini
Associate Administrator for Regulation
and Certification

ARM-209:Eupshaw;fs:1/9/04; PC Docs #20579
cc: ARM-1/20/200/209; AIR-100; ANM-110
File #ANM-01-024-A; ANM-00-083-A; ANM-98-466-A; ANM-01-111-A; ANM-95-195-A.; ANM-99-969-A
Control Nos. 20032768-0, 20033095-0, 20033096-0, 20033097-0, 20033098-0, 20033099-0

Recommendation

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

September 18, 2003

Federal Aviation Administration
800 Independence Avenue, SW
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Attention: Mr. Nicholas Sabatini, Associate Administrator for Regulation and Certification

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Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
Effie Upshaw – FAA-Washington, D.C.
Amos Hoggard - Boeing

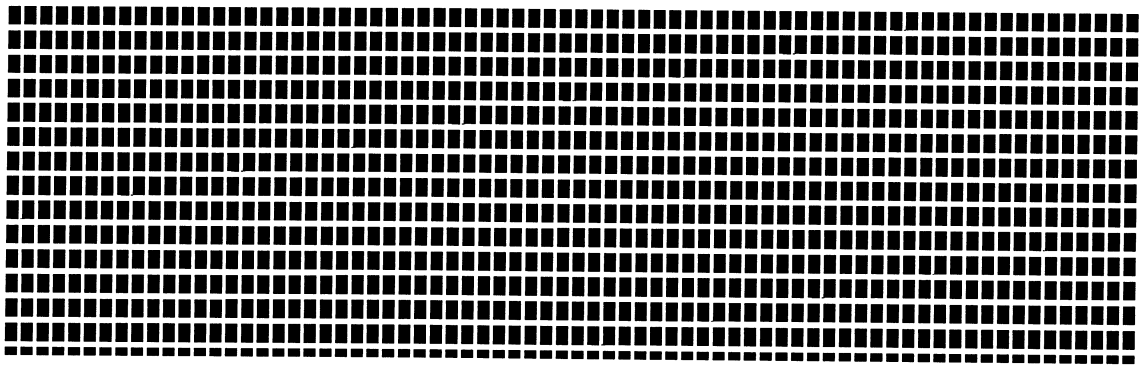
A REPORT OF THE
AIRWORTHINESS ASSURANCE WORKING GROUP

RECOMMENDATIONS FOR REGULATORY ACTION TO ENHANCE CONTINUED AIRWORTHINESS OF SUPPLEMENTAL TYPE CERTIFICATES

FINAL REPORT

January 21, 2003

SIGNED BY



Kyatsandra Gopinath
Co-Chairperson, AAWG
Boeing Commercial Airplanes

Aubrey Carter
Co-Chairperson, AAWG
Delta Air Lines

REVISION PAGE

LTR	DATE	CHANGE	PAGES ADDED	PAGES DELETED	PAGES CHANGED	APPROVED BY

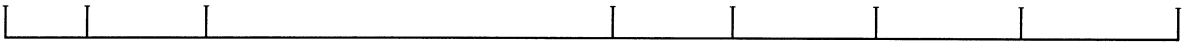


Table of Contents

Abbreviations and Definitions

AAP	Aging Airplane Program
AAWG	Airworthiness Assurance Working Group
ACO	Airplane Certification Office
AD	Accidental Damage
AD	Airworthiness Directive
AFM	Airplane Flight Manual
AMOC	Alternate method of Compliance
AOI	Applicant/Operator/Installer
ARAC	Aviation Rulemaking Advisory Committee
CAR	Civil Aviation Regulations
CAW	Continued Airworthiness
CFR	Code of Federal Regulations
CG	Center of Gravity
CIC	Corrosion Inhibiting Compound
CPCP	Corrosion Prevention and Control Program
CRI	Certification Review Item
CSTC	Complex Supplemental Type Certificate
DAS	Delegated Authority Station
DDP	Detail Design Point
DDS	DAS/DOA/SFAR
DER	Designated Engineering Representative
DOA	Delegation Option Authorization (FAA)
DOA	Design Organization Approval (JAA)
DSG	Design Service Goal
ED	Environmental Damage
FAA	Federal Aviation Administration
FEA	Finite Element Analysis
FOD	Foreign Object Damage
ICA	Instructions for Continued Airworthiness
ISP	Inspect Start Point
JAA	Joint Airworthiness Authority
JLP	Joint Local Procedures
JMP	Joint Multinational Procedures
LOV	Limit of Validity
MCSTC	Multiple Complex Supplemental Type Certificate
MED	Multiple Element Damage
MIDO	Manufacturing Inspection District Office
MLW	Maximum Landing Weight
MOU	Memorandum of Understanding
MPD	Maintenance Planning Document
MRA	Maintenance Repair and Alteration

MRB	Maintenance Review Board
MSD	Multiple Site Damage
MSG3	Maintenance Steering Group - 3
MTOGW	Maximum Takeoff Gross Weight
MZFW	Maximum Zero Fuel Weight
NAA	National Airworthiness Authority
NDT	Non-destructive Testing
NPRM	Notice of Proposed Rulemaking
ODA	Organization Designation Authorization
ODAR	Organization Designation Authorization Representative
OEM	Original Equipment Manufacturer
OMP	Operators Maintenance Program
OMT	Organization Management Team
PAX	Passenger
PC	Production Certificate
PCA	Primary Certification Authority
PCM	Project Certification Manager
PLR	Production Limitation Record
PMA	Parts Manufacturing Approval
PSE	Principal Structural Element
RAG	Repair Assessment Guidelines
RAP	Repair Assessment Program
SFAR	Special Federal Aviation Regulation
SMP	Structural Modification Point
SSI	Significant Structural Item
SSIP	Structural Supplemental Inspection Program
STC	Supplemental Type Certificate
STG	Structures Task Group
TAD	Transport Airplane Directorate
TAEIG	Transport Airplane and Engine Issues Group
TC	Type Certificate
ULD	Unit Load Device
WFD	Widespread Fatigue Damage

References

FAA Order 8110-4b entitled, "Type Certification", dated April 24, 2000

FAA AC 21-40 entitled, "Application Guide for Obtaining a Supplemental Type Certificate", dated May 6, 1998

FAR 25.1529 entitled, "Instructions for Continued Airworthiness (Amendment 25-54)", Effective October 14, 1980

Section H25.4 entitled, "Airworthiness Limitations section (Amendment 25-102)", Effective June 6, 2001

AC 91-56A entitled, "Continuing Structural Integrity Program for Large Transport Category Airplanes", dated April 29, 1998

Section 1 - Executive Summary

On March 21, 2001, the FAA formally notified the Aviation Rulemaking Advisory Committee (ARAC); Transport Airplane and Engines Group (TAEIG) through the Federal Register (**16089Federal Register / Vol. 66, No. 56 /**) of a new task assignment for action.The FAA requested the Aviation Rulemaking Advisory Committee to study the effects of multiple complex structural supplemental type certification (STC) modifications installed on transport category airplanes. The ARAC will develop a report with recommendations for a long-term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operations of transport category airplanes. This Task was assigned to the Airworthiness Assurance Working Group (AAWG) to complete. This report documents the findings of the Working Group for this Task.

The AAWG met a total of five times to accomplish the work set forth in the Tasking Statement. The AAWG reviewed the process for certification and application of structural STCs to airplanes and reached the following seven conclusions.

1. The AAWG found that subsequent to certification and application of an STC to the first airplane, the application of an approved structural STC to another airplane could be made without a conformal review of that airplane's configuration. Without such a review, there is no guarantee that the certified configuration of the structural STC is compatible with the airplane configuration. There may be other STCs, repairs, service bulletins installed and/or Airworthiness Directives in effect on that airplane that might adversely affect the validity of the proposed structural STC or visa versa.

2. The AAWG found that a new classification of a STC should be introduced known as a Complex Supplemental Type Certificate (CSTC). An STC is considered complex if it:

   a. Alters the design loads (static and/or fatigue) that affect a significant portion of the airplane structure, and/or
   b. Causes a change to the approved instructions for continued airworthiness, the Airplane Flight Manual and/or the Weight and Balance Manual.

   NOTE: A CSTC may or may not physically modify the airplane structure.

3. While the AAWG found that current procedures for certification of an STC are sufficient and do not require modification, there are procedural changes required for STCs classified as CSTCs.

4. The AAWG found that the guidance material defining the responsibility of the STC applicant is lacking in that it did not define the applicant's responsibility for continued airworthiness issues.

5. The AAWG found that the responsibility for configuration control of the airplane is vague and misleading and needs to be strengthened.

6. Considering the findings, the AAWG concluded that additional Special Certification Reviews should be conducted for situations where multiple CSTCs may have been installed to validate that the continued airworthiness programs have been properly updated.

7. The AAWG found differences in the means JAA and FAA administrate the granting and transferring of STCs. While the differences are cultural in nature, it is deemed that the processes are equivalent in intent.

Considering the conclusions reached by the AAWG, the AAWG recommends that the Aviation Rulemaking Advisory Committee (ARAC), Transport Airplane and Engine Issues Group (TAEIG) consider enacting the following five recommendations to ensure proper consideration of how an STC might interact and affect certification, aging airplane and continued airworthiness programs.

A. The existing STC Limitations and Conditions template should be revised. The current wording implies that it is the installer's responsibility to ensure that the incorporated STC does not introduce any adverse effects on the airplane. It is the recommendation of the AAWG that this responsibility be placed with the Operator/STC holder/Installer. This includes configuration control, STC compatibility with actual airplane, and continued airworthiness in regard to the STC design and application. This will require a new 14 CFR 21 rule with a revision to AC 21-40, new operating rules with an advisory circular (AC), and a change to Order 8110.4b.

B. Require a special identification of complex STCs, where the installation may result in interaction effects with other STCs. The recommendation would require the determination of a complex STC by applicants for new STCs. This will require a new 14 CFR 21 rule, revision to Order 8110.4b and AC 21-40.

C. Establish a set of criteria to consider in evaluating interaction effects amongst complex STCs. This recommendation would require the development of an FAA Order and possibly some advisory material.

D. Require all STC applicants to provide information within the Instructions for Continued Airworthiness of the regions and areas affected by the proposed STC. This will require a new part 21 rule, possible revision to §

25.1529, Appendix H, revision to AC 21-40 and Order 8110.4b.

E. The AAWG further recommends that the FAA conduct a Special Certification Review of those items (listed below) categorically classified as CSTCs to determine any additional maintenance actions required as a result of interactions not considered when the CSTC was installed:
   a. Hush kits,
   b. Winglets,
   c. Auxiliary fuel tanks,
   d. Re-engine,
   e. Weight increases,
   f. PAX cargo conversions
   g. Reinforced Flight Deck Doors

F. The AAWG recommends that the FAA and JAA regulations specific to certification and continued airworthiness of STCs and CSTCs be harmonized to the extent possible.

Section 2 - Introduction and Background

Under the provision of Title 14 of the Code of Federal Regulations, Part 21, an applicant who has shown compliance with the other pertinent sections of Title 14, may obtain a Supplemental Type Certificate (STC). The holder of a supplemental type certificate may use the approved engineering data to either physically modify the airplane or modify the way the airplane is flown or both. STCs can effect both the structure and systems of an airplane. This study is limited to structural issues.

The industry has used STCs for weight increases, winglet installations, passenger to cargo conversions, hush-kits, and fuselage fuel tank additions just to name a few. Once approved, the STC holder may apply the STC to any airplane for which type approval was given. The STC is also a commodity that the STC holder may sell or use to derive licensing fees. While there are other means of modifying a type certificate, STCs are the only means studied by this report.

In general, the granting of an STC follows the same path any certification program would follow. The path is described in FAA Order 8110-4b Ref [1]. A rigorous evaluation of the engineering analytical and test data is performed in light of the configuration of the airplane for which the modification is being considered. When compliance is found with all of the applicable rules and regulations, the STC is granted.

In the late 1980's, the FAA began to pass rules that limited the amount of noise produced by airplanes. These new rules limited the usefulness of some commercial airplanes because of the cost of either installing hush-kits or installing new, quieter engines. As a result, a number of airplanes became available that could be economically modified for cargo operation. A few enterprising individuals saw an opportunity to modify these airplanes for cargo operation and developed STCs that were subsequently approved by the FAA. These STCs included the following generic categories:

1) Install Upper deck Cargo Doors
2) Perform Weight Increases
3) Strengthen Floors
4) Install Hush-kits
5) Install winglets for improved performance

Review of these STCs in the late 1990's revealed that several of the STCs did not meet basic CAR 4b standards. In the process of reviewing the impact of this revelation, ADs were issued to insure fleet safety and questions were raised

about the basic certification process. As a result the FAA has amended its procedure for certification of STCs to insure that proper coordination (FAA Order 8110.4b and FAA AC 21-40) is in place to ensure uniform application of the regulations to type design but other questions remained. Principal amongst these was the question of STC interaction where several STCs could be placed on an airplane where independently, they would not be a significant concern but jointly would require additional modifications to the structure and/or amendment to the ICA or other operational documents for safety.

This report examines the STC certification process and makes suggestions as to how that process might be amended to identify STCs that might interact adversely with other STCs. This process would include a requirement that would prevent application of interacting or complex STCs without a thorough review of airplane configuration

Section 3 - ARAC Tasking

On March 21, 2001, the FAA formally notified the Aviation Rulemaking Advisory Committee; Transport Airplane and Engines Group through the Federal Register (**16089 Federal Register / Vol. 66, No. 56 /**) of a new task assignment for action. The FAA requested the Aviation Rulemaking Advisory Committee to study the effects of multiple complex structural supplemental type certification (STC) modifications installed on transport category airplanes. The ARAC will develop a report with recommendations for a long-term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operations of transport category airplanes. The complete text of the Tasking Statement appears in Appendix A. Subsequently, the ARAC, Transport Airplane and Engines Issues Group assigned action to the Airworthiness Assurance Working Group. The Task Assignment involves completion of the following items.

Task Title: Task 7, Multiple Complex Supplemental Type Certificates

Study the effects of multiple complex structural STC modifications installed on transport category airplanes. Develop a report with recommendations for a long term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operation of transport category airplanes, and the ability of the operators to accomplish mandatory FAA aging fleet programs.

The report should identify the types of structural modifications considered to be complex STC modifications, and should propose recommended actions to be taken by the FAA to address the effects complex structural STC modifications have on the structural integrity and continued safe operation of modified airplanes.

The report and recommendations should contain the following:

1. A description of FAA and industry actions necessary to identify the interaction effects of multiple complex STC modifications,

2. A description of FAA and industry actions that will address the effects that complex modifications have on aging airplane issues, and

3. A description of FAA and industry actions necessary to address the effects that complex modifications have on FAA mandated airworthiness actions (i.e., airworthiness directives, aging airplane programs).

Schedule: The report should be completed no later than September 28, 2002.

As a result of the completion of the tasking, the FAA expects a task report detailing the investigations conducted along with recommendations for further FAA Action. While the recommendations may include a requirement to develop regulatory action, the actual writing of that requirement will be reserved to the FAA or assigned as an additional ARAC Tasking.

This report comprises the recommendations from the AAWG on the task assignment from ARAC.

Section 4 - Purpose of Report

This report identifies the types of structural modifications considered to be complex STC modifications, and recommends actions to be taken by the FAA to address the effects complex structural STC modifications have on the structural integrity and continued safe operation of modified airplanes including Airworthiness Directives and aging airplane programs.

Definitions of complex STC's are established in the context of structural effects on the airplane.

From this investigation, recommendations and criteria are defined for evaluating STC's and their interaction with other installed STCs. Means to define and control the configuration of the airplane are also established.

The report is limited to structural STC's only.

Section 5 - Case History and Lessons Learned – PAX to Cargo Modification

The driving force behind the MCSTC tasking originated from the FAA investigation of the PAX to Cargo Conversions. As such, the information gathered and lessons learned through that investigation are relevant and contribute to the purpose of this report. The following is a list of the most significant lessons learned from that investigation.

a. Case History PAX to Cargo Conversion

Investigations into some PAX to Cargo STCs have shown that certain STCs were granted with minimal DER review and FAA ACO involvement. As a result. The process to do PAX to Cargo conversions has been standardized. It is recognized that a common approach to such complex STCs by both the applicant and regulator is beneficial to all parties. The following summarizes the most significant lessons learned from this case history:

b. Lessons Learned

1) Some STCs did not have all of the critical load cases for the structure being modified evaluated in their data packages.

- Example: Installation of a upper deck cargo liner could change rapid decompression analysis. In some of the data packages for PAX to Cargo STCs, this analysis was missing.
- Example: Critical load case for some 727 PAX to Cargo floor beams was upload with a unit load device (ULD) 10% center of gravity (CG) offset. This load case was missing in some 727 PAX to Cargo data packages.

2) Some applicants did not provide design data with adequate detail, assembly, and installation definition and did not account for airplane configuration.

3) Applicant/operator/Installer (AOI) did not have knowledge and/or control of the configuration of the airplane being modified. Examples of where this occurred:

- Example: Installation of a 727 airplane upper deck 9G barrier system installation. The 727-200 airplane has a galley door installed immediately aft of the barrier while the 727-100 has none. In other words, a STCs should not be installed on an airplane whose configuration does not match that of the original first article inspection.

- Example: A large antenna installation STC is sold to an operator who plans to install it on an airplane that already has other complex STCs (such as a cargo conversion) installed. In other words, a STCs should not be installed on airplane until the existing airplane configuration has been evaluated.

4) Data packages did not contain evaluation of STC impact to existing aging airplane programs, mandatory modifications programs, ADs, or other major STCs for subsequent applications of the specified STC.

Section 6 - Complex and Multiple Complex STC's

This report is limited to the discussion of STC's or those portions of STC's that affect airplane structure. The effect that such STC modifications may have on electrical, environmental, avionics, fuel, propulsion systems are not considered.

a. Definitions

An STC is considered complex if it:

- Alters the design loads (static and/or fatigue) that affect a significant portion of the airplane structure, and/or
- Causes a change to the approved instructions for continued airworthiness, the Airplane Flight Manual and/or the Weight and Balance Manual, and

NOTE: A CSTC may or may not modify the airplane structure.

The engineering data of a complex STC (CSTC) addresses and documents the effects on the structure modified by the STC, as well as unaltered structure or structure modified by prior installed STC's or Airworthiness Directives away from the STC installation. Such effects include structural strength, damage tolerance and fatigue properties, and failure modes.

In addition to the structure itself, the CSTC's data package includes new or revised documentation associated with airplane's operation and maintenance programs. Included are (1) Instructions for Continued Airworthiness (ICA), (2) Aging Airplane Programs, (3) Operators' Maintenance Programs, (4) Other FAA mandated programs, and (5) the FAA Approved Airplane Flight Manual and Weight and Balance Manual.

A CSTC does not necessarily modify the structure. An example of this is a weight increase accomplished by restricting the C. G. of the airplane. This operation raises both the external and internal loads for certain areas of the structure that will need to be assessed for static strength and accompanying margins of safety, as well as for damage tolerance,. The results of that investigation may lead to changes in the ICA together with changes to the AFM and Weight and Balance Manual.

Multiple Complex STC's are simply two or more CSTC's that interact with one another. That is, when a later installed STC affects the structure or the

maintenance programs modified by one or more earlier installed STC's, the combined STC's are multiple complex.

b. Criteria for Identifying a CSTC

A CSTC measurably affects one or more of the following items:

1) Weight and/or cg of the airplane.

Significant changes in weight/cg can have a widespread affect on the airplane structure. The magnitude and/or distribution of external loads on fuselage, wing, empennage, control surfaces, and landing gear may be affected. These loads must be evaluated for their significance upon the new as well as the original structure as modified by STCs and repairs, The effect on existing airworthiness programs also need to be evaluated.

2) Aeroelastic properties of major structural components.

Changes in aeroelastic properties include changes to stiffness, major load paths, as well as changes in dynamic response characteristics of the structure. Such changes affect the internal load distributions within the structure. Large cutouts, the addition of heavy mass items, added material, or replacement of one material for another are examples affecting aeroelastic properties.

3) Critical flight or ground external loads.

Changes in critical external loads can have a wide influence, affecting loads on all major structural components. Critical conditions include:

(a) Basic Design Conditions – taxi, take-off, landing, steady and abrupt maneuvers, gust and turbulence, flutter and vibration; sonic fatigue; dynamic landing,

(b) Special Conditions, such as rapid decompression , engine seizure, and special conditions imposed by the regulator for a unique design,

(c) Operational loads on doors, latches, and hinges. Such conditions must be identified and considered in the assessment of the airplane structural integrity, and the possible interaction effects on multiple complex STC's.

4) Internal load distribution near and away from the site of the complex STC's (MCSTC's).

The changes in internal load distribution caused by the STC modification must be evaluated to determine the extent of the structure affected. As discussed above changes in aeroelastic properties and/or external loads cause changes to the

internal loads. Interaction of redistributed internal loads caused by MCSTC's must be evaluated for increased internal stresses and reduced margins of safety (both static and fatigue). To thoroughly evaluate the combined effect of MCSTC's, the effects of existing STC's already on the airplane need to be accounted for and included in the substantiating analysis.

5) Critical Margins of Safety near and away from the site of the complex STC's (CSTC's).

The margins of safety associated with prior installed STC's must be evaluated for possible effects from installation of the new STC.

6) Damage Tolerance Issues

New Inspection items, and intervals may be required, or existing ones revised. See "Effects on Aging Airplane Issues and FAA Mandated Programs" below for further discussion.

c. Examples of CSTC's

Given the above definitions and criteria, several examples of Complex STC's are given below.

1) Passenger-to-Freighter Conversions

Typically such a conversion requires a large cutout in the forward fuselage area, to accommodate the installation of a large cargo door. Floor structure strengthening may also be required. The fuselage structure surrounding the cargo door installation is directly affected as well as the floor beams supporting structure. Fuselage internal load distribution is dramatically altered due to the change in structural stiffness and modified load paths. The floor running loads for a freighter are affected by cg offset and height of the cargo. Additionally, other structural components may also be affected. The airplane c.g. and design speeds envelopes may need to be modified to accommodate the cargo payload. Also, aileron deflections (and loads) must increase to balance the increase in lateral cg offset of payload. This increase results in increased wing bending moment. Another factor is the increased floor running load may input increased loads into the center wing structure. Modifications in the fuel management may also be required to compensate for the center wing load increase. This will require a modification to the Airplane Flight Manual (AFM) and Weight and Balance Manuals The modifications and potential weight increases will affect the continued airworthiness program and will require a assessment of inspections.

2) Operating Weight Increases (MTOGW, MZFW, MLW)

Weight increases have a widespread effect on the airplane. Typically wing loads (shear, torque, moment) are increased. Balancing tail loads are increased, which also affect fuselage structure. Landing gear loads are also affected which can have an adverse affect on Safe-Life limits.

3) Re-engining and Hushkits

In addition to the engine and pylon structure directly affected, such modifications typically add weight to the airplane – affecting c.g. and wing loads, along with horizontal tail and fuselage loads and various parts which might be life-limited(e.g. Safe-Life Parts). Also hushkits may impart sonic vibration to the structure, potentially causing metal fatigue in some thin-skinned components (such as the rudder surfaces) and would effect the ICA. Engine weight increases may affect flutter margins and need evaluation. There may be AFM and Weight and Balance Manual changes to achieve the necessary noise reductions for the hushkits.

4) Winglets

Winglets effectively increase the wingspan, creating increased lift and bending moment at the wingtips. As a result, the center of pressure on the wing shifts outboard toward the wingtip. Overall wing bending moment is increased, even though the operating weight of the airplane remains unchanged. Airplane c.g. and balancing tail loads are also affected. Winglets may also affect flutter margins. These changes may affect the ICA, AFM, and Weight and Balance Manuals.

5) Auxiliary Wing Tip Fuel Tanks

The added weight from the fuel tanks, effectively reduces wing loads for critical up-load conditions. However, critical down loads may increase, such as dynamic landing conditions. Increased aerodynamic drag load also affects wing loading. Airplane cg and balance may also be measurably affected. Auxiliary Wing Tip Tanks may also affect flutter margins. These changes may affect the ICA, AFM, and Weight and Balance Manuals.

6) Auxiliary Fuel Tanks Installed in the Fuselage

The installation causes a significant change in weight distribution in the fuselage structure. The overall airplane weight, c.g., and balance are affected. Like a freighter conversion, the c.g. and design speeds envelopes may be have to be adjusted to maintain acceptable overall balance and loading on the airplane. Structural modification to the local fuselage is required to mount the tanks. These changes may affect the ICA, AFM, and Weight and Balance Manuals.

7) External Door Installation in a Pressurized Fuselage

The cutout in the fuselage affects the structural stiffness and load paths. Consequently, the internal load distribution in the fuselage is affected both near and away from the site of the installation. The installation of a cargo door for a passenger-to-freighter conversion is an example. See "Passenger to Freighter Conversions" above.

The changes of external and internal loads may have a significant effect on the safety margins for static strength, the safe life limits and/or the fatigue and damage tolerance behavior including the WFD parameters of airplane structure. These changes may affect the ICA.

8) Other STCs that may be complex depending on situation

(a) Antenna Installations

Installations of one large or a number of small antennas on an airplane may affect the damage tolerance characteristics. Antennas can create significant aerodynamic loads as well as added weight. The result is the overall c.g., balance, and external loads are affected. Installation of the antenna may create increased inspection requirements (e.g. hidden structure and/or new PSEs) for continued airworthiness. These changes may affect the ICA, AFM, and Weight and Balance Manuals.

(b) Reinforced Flight Deck Doors

While a Reinforced Flight Deck Door does not strictly meet the definition requirement for a CSTC, the sensitivity of this particular STC to the Decompression requirements is deemed sufficient to qualify it as a CSTC. Typically a reinforced flight deck door is considerably heavier than the original OEM door. The rapid decompression venting capability is likely to be altered significantly from the original OEM design. Consequentially the applied loads to the surrounding structure will be altered and may, on occasion, require local structural reinforcement. The doors are typically supported by an adjacent galley, lavatory or other interior item which may have been installed or modified by a STC. Also the altered decompression loads affects the entire fuselage pressurized shell as well as the main deck floor structure.

d. Effects of CSTC Interactions on Aging Airplane Issues and FAA Mandated Programs

On June 1988, FAA sponsored the international conference on aging airplanes where the Airworthiness Assurance Task Force (AATF) was formed. This Task Force, now known as the Airworthiness Assurance Working Group (AAWG), defined recommended corrective actions to assure the continued airworthiness of the structure. This program included specific action in the six areas.

- Update on a regular basis the Supplemental Structural Inspection Program (SSIP)
- Implement a Corrosion Prevention and Control Program (CPCP) taking into account the fleet experience
- Develop a Repair Assessment Program (RAP) to classify and determine appropriate maintenance actions for repairs in the fuselage pressurized shell.
- Review of existing Service Bulletins to define the need of mandatory modifications taking in account the fleet experience
- Develop maintenance recommendations for aging airplanes
- Define actions to avoid Widespread Fatigue Damage (WFD) occurrence for as long as the airplane remains in service

A CSTC will have an effect on these aging airplane issues because it, by definition, has an affect on several important parameters (geometry, load, and stress). While these effects have been considered on the first application, subsequent application of the STC to airplanes of potentially different configuration must be considered. In addition, in case of multiple complex STC installations, combined effects must be considered.

1) Supplemental Structural Inspection Program (SSIP)

The purpose of the SSIP is to ensure continuous structural airworthiness of the airplane. It is developed in accordance with AC 91-56. It is based on a damage tolerance analysis of the PSEs, using stress data, mission profiles and experience from fatigue tests and other applicable experience.

A CSTC could create or modify a PSE requiring a new fatigue and damage tolerance assessment to account for:

- Change of the loads and stresses, including new load spectra for fatigue justification.
- Modification of the inspection conditions (i.e. access, NDT method applicability)
- Creation of a new Detail Design Point within an existing PSE.
- Creation of a new PSE

In the case of multiple complex STC, a PSE can be affected by several changes. The cumulative effect should be defined by a new analysis taking into account the modified structure.

2) Corrosion Prevention and Control Program (CPCP)

The CPCP is intended to control the corrosion conditions of the airplane.

The structural task group (STG) of each airplane model reviews the CPCP contents on a regular basis. The STGs are groups comprised of industry experts on particular airplane models, representing both the manufacturer and operators, that were formed to provide advice to the manufacturers on aging structural issues. The corrosion tasks are defined first with an MSG3 analysis taking into account environmental condition, material and usage and they are possibly updated with the in-service experience.

A complex STC can affect this program for the following reasons:

- Use or change of materials with different corrosion sensitivity
- Modification to the protection scheme.
- Mixing new material with existing one that affects the galvanic corrosion conditions
- Change to the access conditions.
- Change of the usage of the airplane (i.e. Pax to freighter conversion) that modify operational parameters, leading to a review of the environmental analysis.

In the case of multiple complex STC affecting the same zone a new maintenance requirement should be defined by a new analysis. For example, installing an interior modification involving a lavatory and a galley directly above a STC installed aux fuel tank creates a condition where both accessibility and environment are compromised.

3) Repair Assessment Program (RAP)

Since May 2001, Repair Assessment program is a requirement of the FAR 91-140 and 121-370. It requires assessing any repairs in the fuselage pressurized shell in order to classify each repair as either permanent or temporary. Secondly, the program defines the necessary supplemental inspection program for the repair. The categorization and inspection definition is based on guidelines taking into account damage tolerance analyses.

If a CSTC affects the loads and stresses of the pressurized shell, new analysis must be performed for the repairs in the affected areas. The STC ICA is also changed and approved by the authority. Each CSTC should define these affected areas.

The new analysis has the potential of changing the repair classification (permanent with or without inspections, temporary) and/or the associated inspection program.

In case of more than one CSTC affecting a given area, the cumulative effect should be defined by a new analysis.

4) Mandatory Modifications Program

Each Structure Task Group (STG) reviews existing Service Bulletins (SBs) in order to collect in-service experience and propose, if necessary, mandatory corrective actions. Each operator within the STG rates the SBs based on their service experience. From this and other OEM data a decision is made on whether or not to propose the SBs to the FAA for mandatory modification or inspection programs.

A CSTC changes conditions (loads, stresses, access...) in an area therefore the original STG conclusions need to be reassessed (i.e. revised threshold...)

The concern exists however, that the STC Holder is not part of the STG process and sharing of in service findings is generally limited to the FAA. It is up to the STC Holder and the Operator to insure that the threshold for any future mandatory modification is assessed and adjusted appropriately.

Obviously, the situation is worst in case of Multiple Complex STCs because the number of possibly involved STC holders.

5) Develop Maintenance Recommendations for Aging Airplanes

In examining the issues surrounding the 1988 Aloha accident, the industry discovered that there was little guidance available for maintenance programs for an operator who was trying to maintain an ageing aircraft. The AAWG authorized the production of a document with the help of the ATA, AIA, and FAA that provides the necessary guidance. This document is available from the ATA as ATA Report 51-93-01

6) Widespread Fatigue Damage (WFD) / Limit of validity (LOV)

Widespread Fatigue Damage rulemaking activity is currently ongoing but is not yet completed. Draft Advisory Circular AC91-56B is prepared. The proposed WFD rule would require that analysis be performed for any structural detail prone to multiple site damage (MSD)/multiple element damage (MED). The analysis will define the maintenance program necessary for safe operation (i.e. an Inspection Starting Point (ISP) and/or the Structure Modification Point (SMP)).

A CSTC may affect the WFD analysis in the following ways:

- A CSTC can introduce new structural details susceptible to MSD/MED

(e.g. new large joint). A new WFD analysis should be done to define the maintenance program requirements within the defined LOV of the existing maintenance program.

- Where existing structure is affected by the CSTC, the MSD/MED prone areas must be reviewed to ensure that their maintenance programs are still valid for the defined LOV (e.g the circumferential fuselage splices near the wing will require a reassessment because of higher loads caused by a gross weight increase).

7) Effect on other Airworthiness Directives

Other ADs, not included in the above paragraphs are usually due to in-service problems that have been analyzed with specific conditions (experience, load, and configuration...). The concern here is that an AD in effect on an airplane at the time a CSTC is installed following initial certification, may not be properly addressed. The evaluation of the effects of the CSTC must be accounted for in the instructions for continued airworthiness with an AMOC.

Any complex STC which affects any applicability conditions (access, NDT method feasibility...) of an AD or the load/stress of its area should lead to a new analysis of this AD requirements.

e. Effects on Airplane Configuration of CSTC Installation

The main parties involved in STCs (applicant, installer and FAA) currently assume or in some cases ensure an airplane's configuration is understood and assessed for impact with a proposed new STC. The current amount of evaluation and assessment can range from comprehensive to non-existent.

The regulatory requirement for this type of evaluation and assessment is contained in FAA Order 8110-4B, Section 4-2.e.1. Per this section of the FAA Order, the STC applicant for first article installations is generally required to determine the configuration of the affected airplane being modified. Configuration means type certificate basis, any STCs or service bulletin previously applied, any major repairs, and any ADs in effect for the particular airplane being considered. If interactions are discovered between the existing configuration and the proposed STC, the applicant generally includes requirements in the Instructions for Continued Airworthiness (ICAW) to address the interactions as part of the engineering package for certification.

Actual experience shows that STC applicants try to understand and take into account configurations but do not always know the extent of previous modifications or their interactions with their proposed STC.

Installers are typically the least prepared to conduct a thorough evaluation and analysis of the interaction effects between the existing configurations and the proposed STC. They may know the configuration, but lack the means for understanding how it interacts with the STC. However, current STCs have boilerplate statements that the *installer* is responsible to ensure it does not adversely impact airworthiness of the airplane (FAA Order 8110-4b Section 4-4.f.2). Since the installer does not possess the engineering data that defines the configuration and how it interacts with the STC being installed, the installer generally only evaluates fit, form and function. This leaves another loophole for inadequate interaction evaluations.

Another problem is understanding and addressing airplane configuration on subsequent airplanes being modified per a previously approved STC. There are no requirements placed on the STC holder or the type certificate holder for these follow-on installations. Current STC paperwork shows to which airplane type the modification applies, but not to specific factory serial numbers. It does not, as a matter of common practice, state applicability down to the airplane serial number. Airplane within a fleet model and series can vary significantly from tail number to tail number.

f. Effects of Interactions on operator approved maintenance programs.

The current requirements of the FAR require the development of structural maintenance programs that prevent catastrophic failure of the airplane due to accidental, environmental, and fatigue damage. One means of accomplishing this is by implementing an MSG-3 process to develop the structural maintenance program. If the applicant desires to use this approach then the accidental damage, environmental damage and fatigue damage programs need to be reevaluated.

Section 7 - Potential Effect on Operators

The installation of new CSTCs will have the following effects on operators:

a. *Installation Requirements*

Operators would be required to determine, document and record configuration differences and interaction effects on each airplane incorporating multiple complex STCs vs. current requirement for conformity inspection on only the first airplane accomplished. In order to accomplish this the operator, installer and STC holder would need to establish responsibilities in the STC installation process. Cooperation would be require between the operator, installer and STC Holder to determine the current configuration, that would allow the STC holder to assess the effect the new STC will have on the current configuration. One process might be as follows:

1) Preparation For STC Installation

Prior to installation of a STC, the operator is responsible for providing information to the installer concerning the current configuration of the aircraft. This information shall be based on aircraft maintenance and modification data in the hands of the operator.

2) Airplane Survey

Using data supplied by the operator, the installer would inspect the aircraft to confirm the configuration prior to installation and/or provide information to the operator concerning undocumented Repairs/Alterations/Modifications (RAMs).

3) STC Revalidation

Based on information provided by the installer, the operator shall reassess the aircraft configuration, if necessary, and provide this data to the STC holder for evaluation for STC validation for the specific airplane configuration.

b. Continued Airworthiness Requirements

Operators would be required to develop and incorporate Instructions for Continued Airworthiness (ICA) for each STC addressing interaction effects with the following programs:

- Aging Airplane Programs (S/B Modifications, CPCP, SSIP, RAG, WFD)
- Airworthiness Directives (and record of equivalent level of safety technical data) for changed structure
- MPD, MSG-3 maintenance program changes (see Section 6f)

Section 8 - Regulatory Options

a. Discussion of current STC Practice/Regulations and Significant Issues

1) FAA Regulations and Procedures

(a) Background.

The FAA has been issuing STCs since 1955. The first STC issued by the FAA was SA4-1, which was issued on December 12, 1955. The FAA has a long history of supporting STCs as a means of modification in the commercial fleet. The requirements to obtain an STC are defined in part 21 of 14 CFR.

Per § 21.113, any person may apply for an STC and must apply by the appropriate form (8110-12). The STC by definition is a major type design change.

§ 21.115 describes the applicable requirements that the applicant must meet to obtain an STC

- § 21.101 - Certification Basis
- § 21.93(b) - Classification of changes in type design (Part 36 Noise)
- § 21.93(c) - Part 34 fuel venting and exhaust
- § 21.33 - Inspection and test
- § 21.53 - Statement of conformity

Note: The items above, for example, §21.93(c), would not necessarily apply to all STCs.

Per § 21.117, If applicant meets the requirements of § 21.113 and § 21.115 then they are entitled to an STC.

Per § 21.119, the STC Holder can obtain airworthiness certificates, obtain approval of the installation and obtain a Production Manufacturing Approval to produce multiple copies of the STC item.

Per § 21.50, the STC Holder is responsible to provide Instructions for Continued Airworthiness (ICA) per § 25.1529.

STC Transferability is described in § 21.47. The responsibilities and data retention for STC transfers is described in FAA Order 8110-4b, page 35

Per Order 8110.4B, an STC is effective until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator. The procedures for surrender, suspension, or revocation of an STC are identical to the respective procedures for a TC (§ 21.51)

(b) Delegated Authority Station (DAS)

A DAS is an FAA delegated organization that has been delegated to issue STCs with minimal FAA involvement. Within the DAS FAA delegation, specific limits are defined that limit the scope of work. Normally the FAA will define the certification requirements for the project being accomplished. Beyond that the DAS may develop the data for certification including the ICA, install the STC and release the airplane back into service. As part of the delegation, every DAS has a Quality Procedures Manual that is approved by FAA ACO. The DAS is audited by the cognizant ACO yearly.

The DAS submits an application to the cognizant ACO that describes the certification basis and applicable requirements that will be followed to substantiate the STC. If the application is acceptable the ACO approves the project.

(c) Proposed Organizational Designation Authorization (ODA)

The objective of the ODA is to create a comprehensive, systematic approach for delegating airplane certification, maintenance, and operational functions while maintaining safety. The ODA rule will expand functions which may be delegated and will be available to all organizations. Another objective of the ODA is to ensure compatibility with other Civilian Aviation Systems.

The ODA rule will consolidate all the FAA delegation authorization into FAR Part 183. The ODA is a new subpart D to part 183. The ODA rule will terminate the current delegated organizations after three years: Delegation Option Authorization (DOA) (part 21, subpart J), DAS (part 21, subpart M), SFAR 36 and Organizational Delegation Authorization Representative (ODAR). The ODA rule will also standardize renewal requirements for individual designees.

The ODA rule will expand eligibility for delegations (FAR 183.47). The eligibility for delegation will include anyone having significant and appropriate experience in performing the functions for which the ODA is sought. Those seeking delegation as an ODA could include Repair Stations, Operators, Manufacturers and consultant type organizations. The ODA is for organizations and not for individuals.

The personnel requirements per § 183.51 include the necessity for a qualified ODA Administrator and a staff of engineering, flight test, inspection, maintenance or operations personnel.

The limitations of the ODA are delineated in § 183.55. The ODA may only perform functions as defined in the procedures manual. The ODA may not perform an authorized function if there has been any change that may affect the performance of that function. The ODA may not issue certificate or approval

which requires a finding by the Administrator until the Administrator makes the finding.

The FAA reserves and does not delegate inherently governmental functions such as determining original certification basis, rulemaking, special conditions, equivalent level of safety, surveillance and oversight. The FAA will issue original certificates (e.g. TC, PC, and Repair Stations).

There are various ODA authorized functions:

- TC ODA – Type Certification Functions
- PC ODA – Production Certification Functions
- STC ODA – Supplemental Type Certification (STC) Functions
- Technical Services ODA – Technical Services Functions
- MRA ODA – Requirements for Maintenance, Major Repairs and Major Alterations Functions
- GA ODA – Requirements for General Aviation Functions
- PMA ODA – Requirements for Parts Manufacturer Approval (PMA) Functions

The ODA authorized functions that would be related to CSTCs are the following:

<u>STC ODA Functions</u>

- Repair station/operator/manufacturer
- Approve data/find compliance
- Approve manuals/supplements
- Establish conformity requirements/determine conformity
- Perform compliance inspections
- Issue airworthiness certificates
- Issue STCs

<u>Technical Services ODA</u>
An organization may be granted ODA authorization to function as a "Consultant" type of organization not affiliated with Repair Station, Operator, Manufacturer, etc.

- Issue STCs
- Approve data for major alterations/repairs
- Approve data/find compliance
- Issue airworthiness certificates

The DDS (DAS/DOA/SFAR 36) Order 8110.9 was issued on August 7, 2002. Implementation and experience with DDS is critical to successful implementation of ODA. The priority will be given to transition of existing DAS/DOA/SFAR 26. Experience must be must gained with ODA system before widespread implementation is accomplished

Although the rule sets the regulatory framework to allow increased delegation, most functions are already delegated to organizations and individuals. There will be very few qualified applicants who are not already DAS/DOA/SFAR/ODAR. The major impact will be delegation to PMA holders. The priority in first three years will be transition of existing delegation holders. Existing DAS/DOA/SFAR/ODAR organizations will be managed under the same principals currently in place. ODA adds to increased accountability imposed by DDS Order on the delegated organization. The FAA project management and participation will be the same as it has been for previous designees.

Status of ODA.
The FAA/Industry team working on developing final ODA Order requirements (Draft 8100.ODA) reached final team concurrence Jun 02 and the NPRM is in the process of being released for comment.

2) JAA Regulations and Procedures - Proposed Part 21 JA/JC(NPA)

The underlying principle of a JAA issued STC is, that it is mutually acceptable by all JAA full member Authorities, providing the original product has been certificated or validated by JAA procedures. JAA-STC procedures can be used on non - JAA certificated or validated products but those STCs are not automatically accepted, validation by the individual JAA national authority will be necessary.

(a) Application for an STC

Application for an STC shall be made to the National Authority (NAA) of the applicant.

The NAA will investigate the aspects of Design Organization Approval (DOA) approval under JAR21 Subpart E. The JAA will only accept applications submitted for an STC from an appropriate Design Organization approved under Subpart JA or JC (NPA). If the applicant has no DOA, a DOA investigation is undertaken. If the applicant already holds a DOA, the DOA team leader must evaluate the capabilities of the organization and if necessary update the terms of approval to include novel or specific aspects of the STC.

- Design Organization Approval (DOA)
  - Subpart JA/JC (Cannot get JA-DOA due to size, can only do JAR-22, VLA,Basic Part 23, and JAP-P)
    - Applicant must demonstrate need for approval
    - Must have a Design Assurance system
    - Company exposition

- Terms of approval defining the scope and work definition
- Sufficient Staff and experience
- Adequate facilities and equipment
- Frequent Authority audits
- DOA is not transferable

(b) Classification of an STC

The STC will be classified by the JAA as Category 1 STC, or Category 2 STC

- CAT 1 STC

  Is a major design change, which necessitates a change to Type Certification Basis. In this case the JAA procedure used in the certification/validation of the product is the JMP or JLP process, which in principle is the same as a post-TC procedures for a Major Design Change. The PCM in consultation with the certification authority will decide which disciplines and how many specialists are required to carry out the investigation and approval process.

- CAT 2 STC

  A major type design change that does not necessitate a change to Type Certification basis. For this category STC the approval process will be carried out following the JLP principles by one of the NAA, on behalf of all the other NAAs.

(c) STC Approval

Where the design change involved in the Category 1 STC, is "Significant", the JAA Certification Director will issue a JAA recommendation letter to all NAAs .The following documents will be attached to the JAA recommendation letter for STC approval

- Statement of compliance signed by the Applicant
- Statement of compliance signed by the PCM or PCA -STC
- The STC granted by the NAA of the STC applicant, or the NAA to which the application is made (normally the First Customer Authority) in the case of JAA Validation.

For JAA Validation, other conditions may be defined in the Arrangement made in accordance with JAR 21.N5

(d) STC Supporting Documentation

The authority determines whether STC supporting data can be based on applicant's own resources or through data or support obtained in an arrangement with the TC holder. If an arrangement with the TC holder was used to develop the data, this arrangement must be demonstrated to the authority.
Documents to identify all part of the Type Design and approved Manuals affected by the change. STC definition document, description of changes, drawings, diagrams and schematics should also be included.

- CRIs defining applicable requirements
- Certification program/plan
- Compliance checklist identifying the requirements with which the change has been designed to comply. List of affected Type Design requirements for which a new demonstration of compliance is necessary, supported by analysis or test
- Compliance documents reviewed and approved by the compliance verification experts with the applicant.
- Supplements to manuals or documents required by applicable requirements.
- Accomplishment instructions are part of the STC documentation. They should be prepared by the STC holder and distributed as approved data. Approval of the instructions may be granted directly by the Authority or through the DOA if that privilege has been granted.
- Liaison with production. The STC holder should identify in the STC supporting documentation, the production organization(s) that will receive approved data and assistance in order to permit production of airworthy parts eligible for installation as part of the STC.

(e) Certificate

When the investigation has been completed and compliance has been found, the investigating authority issues a STC certificate.

(f) Mutual Recognition of STC

This is archived by publishing in the JAA Administrative and Guidance Material information on the STCs approved by the NAAs

(g) Post STC Activities

The following activities need to be examined to determine appropriate actions:

- Major Changes

  With the exception noted below and in accordance with JAR 21.117(b) and N117(b) , each major change to that part of a product covered by an

STC must be approved as a separate STC. Except for major changes originating from an STC holder who is also the Type Certificate Holder in which case JC/VP Chapters M/12 or L/12 can be used

- Minor Changes

  Minor changes to that part of a product covered by an STC will be approved in accordance with JAR 21.117(a), by the NAA, or under the DOA of the STC Holder, or under another DOA having the appropriate Terms of Approval. These changes will be accepted automatically by all NAAs. Minor changes to that part of a product covered by a JAA validated STC will be approved in accordance with JAR 21N117(a). These changes will be automatically accepted by the NAAs, in accordance with the Arrangement under JAR-21N5

- Continued Airworthiness

  The STC holder must have a system for collecting, investigating, and analyzing in-service difficulties. Informing operators and reporting to the Authority. The NAA of the STC Holder, or Exporting Authority is responsible for generating and transmitting to the operating States corrective actions relative to STC in-service problems, in accordance with ICAO Annex 8.

(h) STC Transferability

This may only be made to an organization that can satisfy the following:

0. The organization has appropriate DOA approval
0. The STC holder must have a system for collecting, investigating, and analyzing in-service difficulties. Informing operators and reporting to the Authority
0. All relevant STC records (design, drawings, test reports, inspections, changes to product) shall be held by the STC holder and must be at the disposal of the Authority.
0. The holder shall maintain and update manuals
0. Continued Airworthiness of product must be maintained.

(i) Duration of an STC

Effective until surrendered, suspended, revoked, or a termination date is established by the Authority.

b. Summary of Differences in Regulatory Approach FAR/JAR

1) Application

FARs allow any person to apply for an STC.

JARs require JAA to only accept STC applications submitted from an appropriate Design Organization approved under Subpart JA or JC. Persons not covered by a DOA may make application for a Local NAA STC.

2) STC Transferability

FARs allows an STC to be transferred to any person regardless of capability. The new holder is responsible for 21.3 – reporting of failures.

JARs require that an STC may only be transferred to an organization that can satisfy the following:

- The organization has appropriate DOA approval
- The STC holder must have a system for collecting, investigating, and analyzing in-service difficulties. Informing operators and reporting to the Authority
- All relevant STC records (design, drawings, test reports, inspections, changes to product) shall be held by the STC holder and must be at the disposal of the Authority.
- The holder shall maintain and update manuals
- Continued Airworthiness of product must be maintained.

3) STC Supporting Data

FARs do not require that an applicant distinguish where the source of the STC supporting data came from

JARs – The STC supporting data can be based on the applicant's own resource if the Authority deems it acceptable, or it could insist on the TC Holder involvement.

4) Authorized Organizations

FAA – Designated Alteration Stations are approved organizations to issue STCs, modify the airplane and release it back to service. The DAS can only work within their limitations which are agreed to by the local ACO. An applicant does not need to be a DAS to receive an STC from the ACO. The FAA is moving towards ODA.

JAA – Approval of the organization capable to carry out STC work, and

necessary requirements needs to be demonstrated to the National Authority before such approval is granted and subsequently maintained.

c. Regulatory Options to Improve Airworthiness

The discussions that occurred during the meetings revealed five areas where the current regulations and procedures could be improved to clarify responsibilities of both the STC applicant and the FAA in certifying STC. Modifications to existing rules, advisory circulars and FAA Orders are proposed along with new rules and advisory material, including Special Certification Reviews of certain classes of STCs. Existing rules, ACs and FAA Orders include:

- 14 CFR 25.1529
- AC 21-40
- FAA Order 8110.4b

New rules and Advisory Material are proposed for 14 CFR 21 and also include changes to some to-be-determined Operational Rules.

There were several regulatory objectives considered in the process of defining the necessary changes to the rules and procedures. These objectives were obtained from a review of the current regulations and how they were applied in the certification of certain airplanes converted from passenger to cargo operations and the resulting lessons learned.

The first objective was the need to establish configuration control at the airplane level. It was determined that little if any review occurred on application of STCs following the initial installation and certification of an STC. This could mean that interacting STC might be installed on an airplane that could have an adverse affect on the continued airworthiness of the airplane because that interaction was never taken into account.

The second objective was to set in place a mechanism to determine if an STC is complex. This would most likely be the responsibility of the applicant and it is the first step in identifying situations that may require additional certification type activity on subsequent STC installations.

The third objective was to define the responsibilities of the STC holder in respects to continued airworthiness. While this objective is difficult to enact, it was felt by the AAWG to be an essential part of assignment of responsibilities and a mechanism whereby the FAA could establish STC ownership requirements.

The fourth objective was like the first but makes a broader statement as to who owns the responsibility for configuration control and STC compatibility of the proposed modification. This objective changes the responsibility from the installer to the Certificate Holder /STC Holder / Applicant.

The fifth objective will institute a review and amendment (as necessary) of all continued airworthiness programs following and STC installation to assure that those programs contain the necessary changes to account for the installation. This would include accounting for the effects of any other STC installed on the airplane.

The last objective would be to require STC applicants to include information in the ICA that defines the regions structurally affected (loads, stress distributions etc) by the STC.

Section 9 - Conclusions

The AAWG reviewed the certification and application of STC to airplanes and found the following issues.

1. The AAWG found that subsequent to certification and application to the first airplane, the application of an approved structural STC to another airplane could be made without a conformal review of that airplane's configuration. Without such a review, there is no guarantee that the certified configuration of the structural STC is compatible with the airplane configuration. There may be other STCs, repairs, service bulletins installed and/or Airworthiness Directives in effect on that airplane that might adversely affect the validity of the proposed structural STC or visa versa.

2. The AAWG found that a new classification of a STC should be introduced known as a Complex Supplemental Type Certificate. An STC is considered complex if it:

a. Alters the design loads (static and/or fatigue) that affect a significant portion of the airplane structure, and/or
b. Causes a change to the approved instructions for continued airworthiness, the Airplane Flight Manual and/or the Weight and Balance Manual, and

Note: A CSTC May or may not physically modify the airplane structure.

3. While the AAWG found that current procedures for certification of an STC are sufficient and do not require modification, there are procedural changes required for STCs classified as CSTCs.

4. The AAWG found that the guidance material defining the responsibility of the STC applicant is lacking in that it did not define the applicant's responsibility for continued airworthiness issues.

5. The AAWG found that the responsibility for configuration control of the airplane is vague and misleading and needs to be strengthened.

6. Considering the findings, the AAWG concluded that additional Special Certification Reviews should be conducted for situations where multiple CSTCs may have been installed to validate that the continued airworthiness programs have been properly updated.

7. The AAWG found differences in the means JAA and FAA administrate the granting and transferring of STCs. While the differences are cultural in nature, it is deemed that the process was equivalent in intent.

Section 10 – Recommendations

Considering the regulatory objectives contained in Section 8(c), the AAWG recommends that the Aviation Rulemaking Advisory Committee (ARAC), Transport Airplane and Engine Issues Group (TAEIG) consider enacting the following changes to ensure proper consideration of how an STC might interact and affect aging airplane and continued airworthiness programs.

A. The existing STC Limitations and Conditions template should be revised. The current wording implies that it is the installer's responsibility to ensure that the incorporated STC does not introduce any adverse effects on the airplane. It is the recommendation of the AAWG that this responsibility be placed with the Operator/STC holder/Installer. This includes configuration control, STC compatibility with actual airplane, and continued airworthiness in regard to the STC design and application. This will require a new 14 CFR 21 rule with a revision to AC 21-40, new operating rules with an advisory circular (AC), and a change to Order 8110.4b.

B. Require a special identification of complex STCs, where the installation may result in interaction effects with other complex STCs. The recommendation would require the determination of a complex STC by applicants for new STCs. This will require a new 14 CFR 21 rule, revision to Order 8110.4b and AC 21-40.

C. Establish a set of criteria to consider in evaluating interaction effects amongst complex STCs. This recommendation would require the development of an FAA Order and possibly some advisory material.

D. Require all STC applicants to provide information within the Instructions for Continued Airworthiness of the regions and areas affected by the proposed STC. This will require a new part 21 rule, possible revision to § 25.1529, Appendix H, revision to AC 21-40 and Order 8110.4b.

E. The AAWG further recommends that the FAA conduct a Special Certification Review of those items (listed below) categorically classified as CSTCs to determine any additional maintenance actions required as a result of interactions not considered when the CSTC was installed:
   a. Hush kits,
   b. Winglets,
   c. Auxiliary fuel tanks,
   d. Re-engine,
   e. Weight increases,
   f. PAX cargo conversions
   g. Reinforced Flight Deck Doors

F. The AAWG recommends that the FAA and JAA regulations specific to

certification and continued airworthiness of STCs and CSTCs be harmonized to the extent possible.

Appendix A – ARAC Tasking Statement

16089 Federal Register / Vol. 66, No. 56 / Thursday, March 22, 2001 / Notice

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Issues—New Task AGENCY: Federal Aviation Administration (FAA), DOT. ACTION: Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC). SUMMARY: The FAA assigned the Aviation Rulemaking Advisory Committee a new task to study the effects of multiple complex structural supplemental type certification (STC) modifications installed on transport category airplanes. The ARAC will develop a report with recommendations for a long-term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operations of transport category airplanes. This notice is to inform the public of this ARAC activity.

FOR FURTHER INFORMATION CONTACT: John McGraw, 1601 Lind Ave., Renton, Washington 98055–4056, 425–227– 1171, john.mcgraw@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

The FAA established an Aviation Rulemaking Advisory Committee to provide advice and recommendations to the FAA Administrator on the FAA's rulemaking activities with respect to aviation-related issues.

The Task

Study the effects of multiple complex structural STC modifications installed on transport category airplanes. Develop a report with recommendations for a long term plan addressing the effects of multiple complex STC modifications on the structural integrity and continued safe operation of transport category airplanes, and the ability of the operators to accomplish mandatory FAA aging fleet programs.

The report should identify the types of structural modifications considered to be complex STC modifications, and should propose recommended actions to be taken by the FAA to address the effects complex structural STC modifications have on the structural integrity and continued safe operation of modified airplanes.

The report and recommendations should contain the following:

1. A description of FAA and industry actions necessary to identify the interaction effects of multiple complex STC modifications,

2. A description of FAA and industry actions that will address the effects that complex modifications have on aging aircraft issues, and

3. A description of FAA and industry actions necessary to address the effects that complex modifications have on FAA mandated airworthiness actions (i.e., airworthiness directives, aging aircraft programs).

Schedule: The report should be completed no later than September 28, 2002.

ARAC Acceptance of Tasks

ARAC accepted the task and assigned the task to the Airworthiness Assurance Working Group, Transport Airplane and Engine Issues. The working group will serve as staff to ARAC and assist in the analysis of the assigned task. ARAC must review and approve the working group's recommendations. If ARAC accepts the working group's recommendations, it will forward them to the FAA.

Working Group Activity

The Airworthiness Assurance Working Group is expected to comply with the procedures adopted by ARAC. As part of the procedures, the working group is expected to:

1. Recommend a work plan for completion of the task, including the rationale supporting such a plan for consideration at the next meeting of the ARAC on transport airplane and engine issues held following publication of this notice.

2. Give a detailed conceptual presentation of the proposed recommendations prior to proceeding with the work stated in item 3 below.

3. Draft the appropriate documents and required analyses and/or any other related materials or documents the working group determines to be appropriate.

4. Provide a status report at each meeting of the ARAC held to consider transport airplane and engine issues. Participation in the Working Group The Airworthiness Assurance Working Group will be composed of technical experts having an interest in the assigned task. A working group member need not be a representative or a member of the full committee.

An individual who has expertise in the subject matter and wishes to become a member of the working group should write to the person listed under the caption FOR FURTHER INFORMATION CONTACT expressing that desire, describing his or her interest in the task, and stating the expertise he or she would bring to the working group. All requests to participate must be received no later than April 30, 2001. All requests will be reviewed by the assistant chair, the assistant executive director, and the working group chair. Individuals will be advised whether or not the request can be accommodated. Individuals chosen for membership on the working group will be expected to represent their aviation community segment and actively participate in the working group (e.g., attend all meetings, provide written comments when requested to do so, etc.). They also will be expected to devote the resources necessary to support the working group in meeting any assigned deadlines. Members are expected to keep their management chain and those they may represent advised of working group activities and decisions to ensure that the agreed technical solutions do not conflict with their sponsoring organization's position when the subject being negotiated is presented to ARAC for approval.

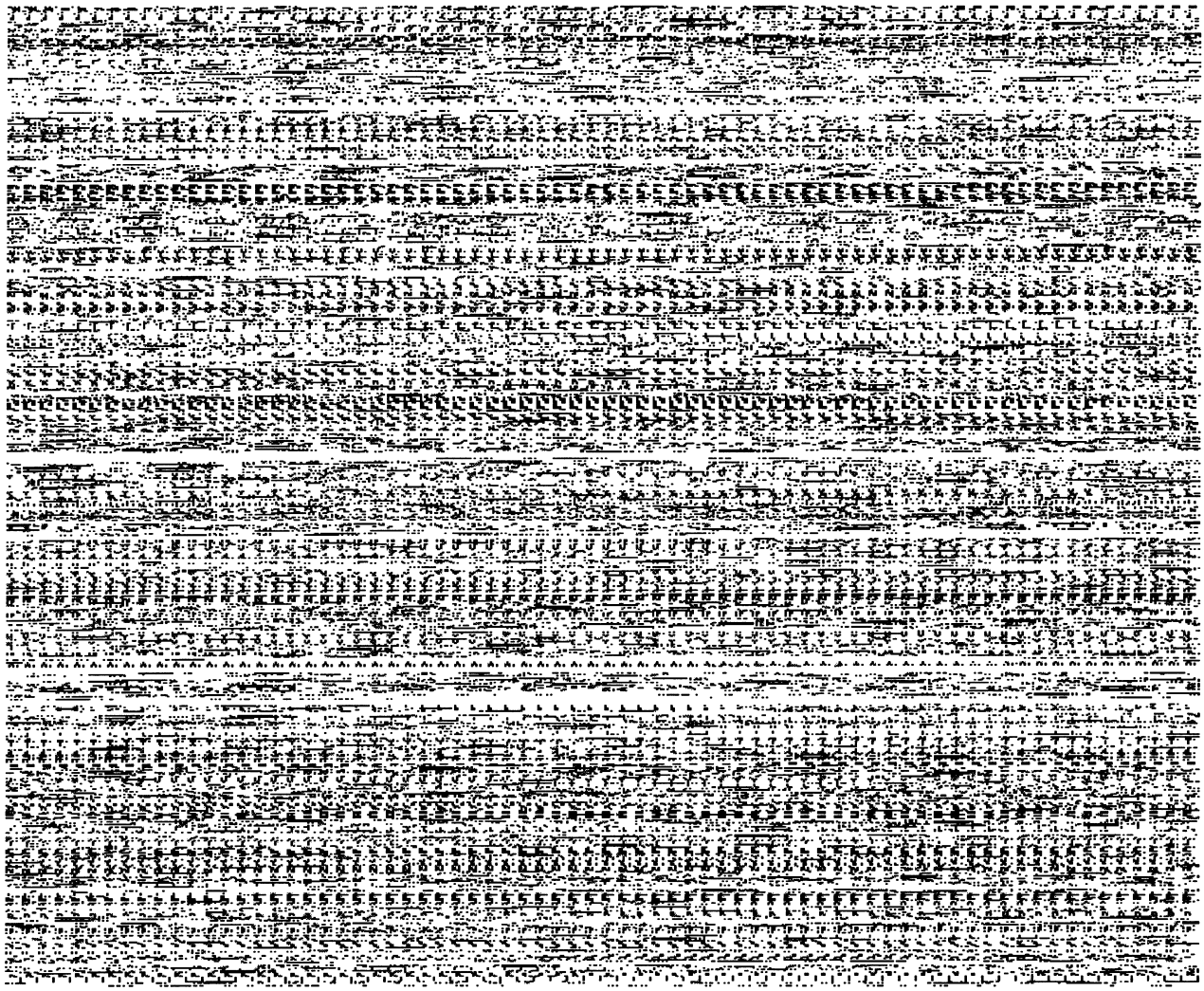
Once the working group has begun deliberations, members will not be added or substituted without the approval of the assistant chair, the assistant executive director, and the working group chair.

The Secretary of Transportation determined that the formation and use of the ARAC is necessary and in the public interest in connection with the performance of duties imposed on the FAA by law.

Meetings of the ARAC will be open to the public. Meetings of the Airworthiness Assurance Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. The FAA will make no public announcement of working group meetings.

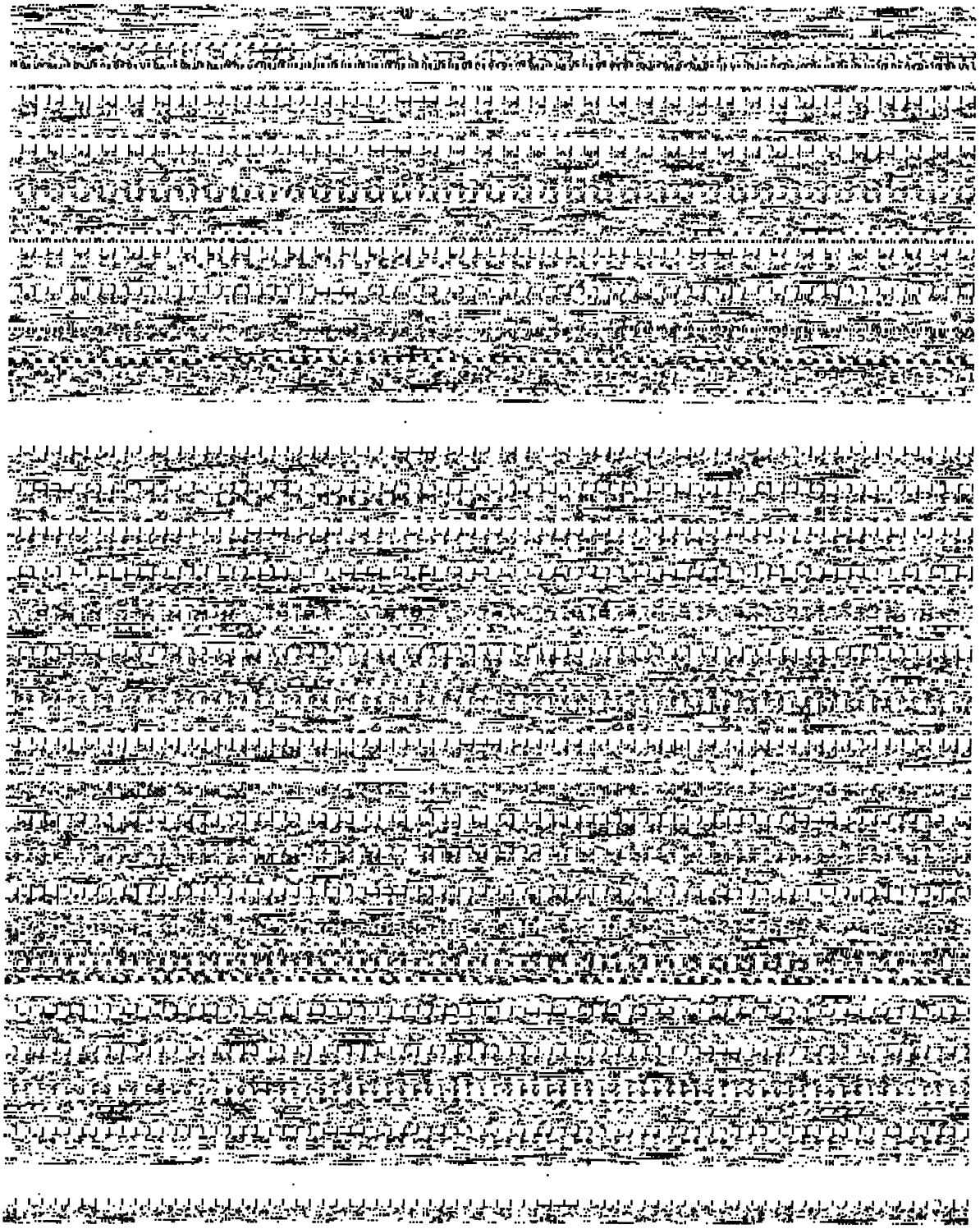
Issued in Washington, DC, on March 14, 2001.
Anthony F. Fazio,
Executive Director, Aviation Rulemaking Advisory Committee.
[FR Doc. 01–7068 Filed 3–21–01; 8:45 am]
BILLING CODE 4910–13–M

Appendix B - AAWG Task Group Make-up



Appendix C - Meeting Venues

Appendix D – Meeting Attendance



FAA Action – Not Available